NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Research at Palomar Observatory in Planetary Astronomy

PERFORMING ORGANIZATION
Division of Physics, Math and Astronomy
California Institute of Technology
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INVESTIGATOR'S NAME
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DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

a) Strategy

A wide range of observational studies are carried out to improve our understanding of the bodies of the outer solar system. Using the 200-inch Hale telescope, near-infrared observations are made of Uranus, Neptune, and the Pluto-Charon system. High time resolution occulation observations of the Uranus Ring system are used to study in detail the dynamics of this system. Occulation studies of Neptune are probing this intriguing "ring-arc" system. Occulation observations of the Pluto-Charon system probe the surface properties of these distant bodies. In addition, the plate material of the PSSII survey is being used to search for new comets and asteroids.

b) Accomplishments

We observed one Neptune stellar occulation in July 1987 and completed the analysis of our series of seven separate Neptune occulation observations in conjunction with Nicholson *et al.*, of Cornell. The analysis has shown that a minimum of three ring arcs, at radii ranging from 54,000 Km - 67,000 Km are required to account for the high quality ring events. Current theoretical models can account for these data. This work was submitted for publication. Of two observations scheduled of Pluto-Charon mutual occulations scheduled for the 200-inch, the Charon eclipse event was successfully observed (the other was clouded out). High signal to noise photometry was obtained in the near-infrared at wavelengths sensitive to the surface composition of volatiles known to exist on planetary surfaces, i.e. Water and Methane. These results show substantial change in the reflectivity of the system as Charon is eclipsed, showing that the surfaces of these bodies are substantially different. The search for new comets and asteroids has been carried out with support from this grant, using plate material of the Palomar Sky Survey II. Three new near-earth asteroids and two new comets were discovered in the four month period July-Oct 87 as the survey began regular production.

c) Anticipated Accomplishments

We shall continue the observational programs carried out in the last years. The 8 July 88 stellar occulation by Neptune will be observed to probe the "ring arc" system. We shall also observe the 21 July 88 stellar occulations by Uranus, with time resolution of 10 milliseconds. Several Pluto-Charon eclipse observations will be observed to map the surface composition of the Southern hemispheres of these systems. In addition, the scanning of the PSSII plates will continue.

d) Publications

Hubbard, W. B., Nicholson, P. D., Lellouch, E., Sicardy, B., Brahic, A., Vilas, F., Bouchet, P., McLaren, R. A., Millis, R. L., Wasserman, L. H., Elias, J. H., Matthews, K., and Perrier 1987, *Icarus*, "Oblateness, Radius, and Mean Stratospheric Temperature of Neptune from the August 20 Occulation".

Nicholson, P. D., Cook, M. L., Matthews, K., Elias, J. H., and Gilmore, G. 1987, *A. J.*, submitted.

Nicholson, P. D., McLeod, B. A., Gilmore, G., Buie, M., and Matthews, K. 1987, *A. J.*, in press.

IAU Circulars

4436 1987 OA
4437 1987 PA
4446 1987 QA
4448 Comet Helin (1987w)
4449 Comet Helin (1987w)
4472 Comet Mueller (1987a1)
4480 Comet Mueller (1987a1)
4495 1982 XB